

a motor connected inside or outside the vehicle body-side tube;

a ball screw nut disposed inside the vehicle axle-side tube, the ball screw nut traveling together with the vehicle axle-side tube; and

a screw shaft that is connected directly or through a power transmission device to a motor shaft of the motor or that is formed integral with the motor shaft, the screw shaft being rotatably threaded into the ball screw nut, wherein

a linear movement of the ball screw nut is converted into a rotational movement of the screw shaft, which is transmitted to the motor shaft, thereby to generate an electromagnetic force, and a torque caused by the electromagnetic force against rotation of the motor shaft is used as damping force for restricting the linear movement of the vehicle axle-side tube.

2. An electromagnetic shock absorber for a vehicle that comprises:

a vehicle body-side tube;

a vehicle axle-side tube slidably inserted inside or outside the vehicle body-side tube;

an upper suspension spring receiver attached to the vehicle body-side tube;

a lower suspension spring receiver attached to the vehicle axle-side tube;

a motor connected inside or outside the vehicle axle-side

tube;

a ball screw nut disposed inside the vehicle body-side tube, the ball screw nut traveling together with the vehicle body-side tube; and

a screw shaft that is connected directly or through a power transmission device to a motor shaft of the motor or that is formed integral with the motor shaft, the screw shaft being rotatably threaded into the ball screw nut, wherein

a linear movement of the ball screw nut is converted into a rotational movement of the screw shaft, which is transmitted to the motor shaft, thereby to generate an electromagnetic force, and a torque caused by the electromagnetic force against rotation of the motor shaft is used as damping force for restricting the linear movement of the vehicle body-side tube.

3. An electromagnetic shock absorber for a vehicle that comprises:

a vehicle body-side tube;

a vehicle axle-side tube slidably inserted inside or outside the vehicle body-side tube;

an upper suspension spring receiver attached to the vehicle body-side tube;

a lower suspension spring receiver attached to the vehicle axle-side tube;

a shaft rotatably inserted inside the vehicle body-side tube;

a coil wound around the shaft;

a permanent magnet that is disposed opposite to the coil in the vehicle body-side tube;

a ball screw nut disposed inside the vehicle axle-side tube, the ball screw nut traveling together with the vehicle axle-side tube; and

a screw shaft that is connected directly or through a power transmission device to the shaft or that is formed integral with the shaft, the screw shaft being rotatably threaded into the ball screw nut, wherein

a linear movement of the ball screw nut is converted into a rotational movement of the screw shaft, which is transmitted to the shaft, thereby to generate an electromagnetic force, and a torque caused by the electromagnetic force against rotation of the motor shaft is used as damping force for restricting the linear movement of the vehicle axle-side tube.

4. An electromagnetic shock absorber for a vehicle that comprises:

a vehicle body-side tube;

a vehicle axle-side tube slidably inserted inside or outside the vehicle body-side tube;

an upper suspension spring receiver attached to the vehicle body-side tube;

a lower suspension spring receiver attached to the vehicle axle-side tube;

a shaft rotatably inserted inside the vehicle axle-side tube;

a coil wound around the shaft;

a permanent magnet that is disposed opposite to the coil in the vehicle axle-side tube;

a ball screw nut disposed inside the vehicle body-side tube, the ball screw nut traveling together with the vehicle body-side tube; and

a screw shaft that is connected directly or through a power transmission device to the shaft or that is formed integral with the shaft, the screw shaft being rotatably threaded into the ball screw nut, wherein

a linear movement of the ball screw nut is converted into a rotational movement of the screw shaft, which is transmitted to the shaft, thereby to generate an electromagnetic force, and a torque caused by the electromagnetic force against rotation of the shaft is used as damping force for restricting the linear movement of the vehicle body-side tube.

5. An electromagnetic shock absorber for a vehicle as set forth in claim 1 or 3, further comprising:

a connecting pipe inserted inside the vehicle body-side tube, wherein

the ball screw nut is connected to one end of the connecting pipe and the other thereof is connected to the vehicle axle-side tube.

6. An electromagnetic shock absorber for a vehicle as set forth in claim 2 or 4, further comprising:

a connecting pipe inserted inside the vehicle axle-side tube, wherein

the ball screw nut is connected to one end of the connecting pipe and the other thereof is connected to the vehicle body-side tube.

7. An electromagnetic shock absorber for a vehicle as set forth in claim 1, or 3, further comprising:

a rotation prevention device that prevents the vehicle body-side tube from rotating relative to the ball screw nut.

8. An electromagnetic shock absorber for a vehicle as set forth in claim 2, or 4, further comprising:

a rotation prevention device that prevents the vehicle axle-side tube from rotating relative to the ball screw nut.

9. An electromagnetic shock absorber for a vehicle as set forth in claim 1 or 3, further comprising:

a vehicle mounting portion that is equipped with the upper suspension spring receiver connected between the vehicle body-side tube and a motor; and

a suspension spring inserted between the upper suspension spring receiver and the lower suspension spring receiver.

10. An electromagnetic shock absorber for a vehicle as set forth in claim 1, 2, 3, or 4, further comprising:

a vehicle mounting portion that is equipped with the upper suspension spring receiver attached to a tip of the vehicle body-side tube and a motor; and

a suspension spring inserted between the upper suspension spring receiver and the lower suspension spring receiver.

11. An electromagnetic shock absorber for a vehicle as set forth in claim 1, 2, 3, or 4, further comprising a vehicle mounting portion, the vehicle mounting portion comprising:

a bracket that connects the vehicle mounting portion to a vehicle;

a bush held and supported by the bracket; and

a rolling bearing held and supported by the bush, wherein

the upper suspension spring receiver is attached to the bracket, and the vehicle body-side tube or the motor is fitted in an inner surface of the rolling bearing.